

Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126823 >C9378	Date Analyzed:	03/04/93
Sample Identification:	PH-F-1	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.2	0.1
Benzene	<0.01	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	<0.1	0.1
Carbon disulfide	<0.01	0.01
Carbon tetrachloride	<0.01	0.01
Chlorobenzene	<0.01	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
Ethylbenzene	<0.01	0.01
2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
4-Methyl-2-pentanone	<0.05	0.05
Styrene	<0.01	0.01
1,1,2,2-Tetrachloroethane	<0.01	0.01
Tetrachloroethene	<0.01	0.01
Toluene	0.02	0.01
1,1,1-Trichloroethane	<0.01	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
Xylenes (total)	<0.01	0.01

* Results are blank corrected.

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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126823 >C9378	Date Analyzed:	03/04/93
Sample Identification:	PH-F-1	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Butenone	1
C5H10 hydrocarbons and Unknown compound	0.1
Acetaldehyde	0.1
C6H14 hydrocarbon	0.07
Hexanal	0.06
C6H10 hydrocarbon	0.06
Acetonitrile	0.06
Butanal	0.06
Unknown aldehyde or ketone	0.05
Propanal	0.05
Pentenone	0.05
C5H8 hydrocarbon	0.05
Pentanal	0.04
Butenal	0.04
Pentanone	0.03

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9231	Date Analyzed:	02/16/93
Sample Identification:	PH-G-2 (1992)	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.8	0.1
Benzene	1.1	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	0.2	0.1
Carbon disulfide	0.02	0.01
Carbon tetrachloride	<0.01	0.01
** Chlorobenzene	0.06	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
** Ethylbenzene	0.08	0.01
** 2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
** 4-Methyl-2-pentanone	<0.05	0.05
** Styrene	0.10	0.01
** 1,1,2,2-Tetrachloroethane	<0.01	0.01
** Tetrachloroethene	<0.01	0.01
** Toluene	0.10	0.01
1,1,1-Trichloroethane	<0.01	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
** Xylenes (total)	0.11	0.01

* Results are blank corrected.

** Concentrations are estimated due to low Internal Standard recovery.

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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9231	Date Analyzed:	02/16/93
Sample Identification:	PH-G-2 (1992)	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Hydrochloric acid	20
Acetic acid	9
Phthalic anhydride	4
C9H16 hydrocarbons	2
Unknown aromatic compound	0.7
Fluorotrimethylsilane	0.7
C5H10O alcohol and Possible Methyl sulfone	0.7
C9H18 hydrocarbon	0.7
Unknown hydrocarbon	0.5
Ethyl hexanol	0.5
Unknown acid ester	0.5
Unknown compound	0.5
C10H18 hydrocarbon	0.5

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9226	Date Analyzed:	02/16/93
Sample Identification:	PH-G-2 (1992)	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.3	0.1
Benzene	0.16	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	0.1	0.1
Carbon disulfide	<0.01	0.01
Carbon tetrachloride	<0.01	0.01
Chlorobenzene	0.02	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
Ethylbenzene	<0.01	0.01
2-Hexanone	0.07	0.05
Methylene chloride	<0.05	0.05
4-Methyl-2-pentanone	<0.05	0.05
Styrene	0.04	0.01
1,1,2,2-Tetrachloroethane	<0.01	0.01
Tetrachloroethene	0.01	0.01
Toluene	0.03	0.01
1,1,1-Trichloroethane	0.02	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
Xylenes (total)	0.03	0.01

* Results are blank corrected.

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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9226	Date Analyzed:	02/16/93
Sample Identification:	PH-G-2 (1992)	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

C11H22 hydrocarbons and Unknown compounds	3
Chloropentanone	1
C12H24 hydrocarbon	1
Acetic acid	0.7
C9H18 hydrocarbon	0.7
C10H18 hydrocarbon	0.6
Unknown aromatic compound	0.6
C10H22 hydrocarbons	0.5
C9H16 hydrocarbon and Unknown acid ester	0.4
Possible Methyl sulfone	0.3
Unknown hydrocarbon	0.3
Ethyl hexanol	0.3

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9379	Date Analyzed:	03/04/93
Sample Identification:	PH-G-2 (1992)	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.1	0.1
Benzene	0.51	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	<0.1	0.1
Carbon disulfide	0.23	0.01
Carbon tetrachloride	<0.01	0.01
Chlorobenzene	<0.01	0.01
Chloroform	0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
Ethylbenzene	<0.01	0.01
2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
4-Methyl-2-pentanone	<0.05	0.05
Styrene	<0.01	0.01
1,1,2,2-Tetrachloroethane	<0.01	0.01
Tetrachloroethene	<0.01	0.01
Toluene	0.04	0.01
1,1,1-Trichloroethane	<0.01	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
Xylenes (total)	0.03	0.01

* Results are blank corrected.

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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126824 >C9379	Date Analyzed:	03/04/93
Sample Identification:	PH-G-2 (1992)	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Acetaldehyde	0.6
Possible Methyl sulfone	0.4
Unknown aromatic compound	0.3
Possible Phosphinic acid, alkyl ester	0.3
C6H12 hydrocarbon	0.04
Unknown compound	0.04
Butyl acetate	0.04
C5H8 hydrocarbon	0.04
Difluorodimethylsilane	0.03
Hexanal	0.03
C5H10O alcohol	0.03
C6H14 hydrocarbon	0.03
Acetonitrile	0.03

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
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Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9232	Date Analyzed:	02/16/93
Sample Identification:	PH-G-3 (1989)	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.2	0.1
** Benzene	0.15	0.01
** Bromodichloromethane	<0.01	0.01
** Bromoform	<0.01	0.01
** 2-Butanone	<0.1	0.1
Carbon disulfide	0.01	0.01
** Carbon tetrachloride	<0.01	0.01
** Chlorobenzene	0.01	0.01
Chloroform	<0.01	0.01
** Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
** 1,2-Dichloropropane	<0.01	0.01
** cis-1,3-Dichloropropene	<0.01	0.01
** trans-1,3-Dichloropropene	<0.01	0.01
** Ethylbenzene	<0.01	0.01
** 2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
** 4-Methyl-2-pentanone	<0.05	0.05
** Styrene	0.03	0.01
** 1,1,2,2-Tetrachloroethane	<0.01	0.01
** Tetrachloroethene	<0.01	0.01
** Toluene	0.01	0.01
** 1,1,1-Trichloroethane	<0.01	0.01
** 1,1,2-Trichloroethane	<0.01	0.01
** Trichloroethene	<0.01	0.01
** Vinyl acetate	<0.05	0.05
** Xylenes (total)	0.02	0.01

* Results are blank corrected.

** Concentrations are estimated due to low Internal Standards recovery.

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Analytical Results
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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9232	Date Analyzed:	02/16/93
Sample Identification:	PH-G-3 (1989)	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Phthalic anhydride	70
C12H24 hydrocarbons	20
C11H22 hydrocarbon	5
Possible Methyl sulfone	4
Acetic acid	2
Unknown compound	1
Unknown aromatic compound	0.5
Hexanal	0.2
C10H22 hydrocarbon	0.2
Unknown acid ester	0.2
C10H18 hydrocarbon	0.2
C9H16 hydrocarbon	0.2

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9227	Date Analyzed:	02/16/93
Sample Identification:	PH-G-3 (1989)	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.2	0.1
Benzene	0.06	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	<0.1	0.1
Carbon disulfide	<0.01	0.01
Carbon tetrachloride	<0.01	0.01
** Chlorobenzene	0.01	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
** Ethylbenzene	<0.01	0.01
** 2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
** 4-Methyl-2-pentanone	<0.05	0.05
** Styrene	0.02	0.01
** 1,1,2,2-Tetrachloroethane	<0.01	0.01
** Tetrachloroethene	<0.01	0.01
** Toluene	<0.01	0.01
1,1,1-Trichloroethane	0.02	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
** Xylenes (total)	<0.01	0.01

* Results are blank corrected.

** Concentrations are estimated due to low Internal Standard recovery.

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Analytical Results
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Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9227	Date Analyzed:	02/16/93
Sample Identification:	PH-G-3 (1989)	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Acetic acid	1
Possible Phosphinic acid, alkyl ester	0.9
C12H24 hydrocarbons	0.7
C11H22 hydrocarbon and Unknown siloxane	0.6
Possible Methyl sulfone	0.5
Ethyl hexanol	0.3
C11H24 hydrocarbon	0.3
Unknown compound	0.3
Heptanal	0.3
Butoxyethanol	0.3
Nonanal	0.2
Octanal	0.2
Ethyl hexanoic acid	0.2
Hexanal	0.2

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9381	Date Analyzed:	03/05/93
Sample Identification:	PH-G-3 (1989)	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.1	0.1
Benzene	0.02	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	<0.1	0.1
Carbon disulfide	<0.01	0.01
Carbon tetrachloride	<0.01	0.01
Chlorobenzene	<0.01	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
Ethylbenzene	<0.01	0.01
2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
4-Methyl-2-pentanone	<0.05	0.05
Styrene	<0.01	0.01
1,1,2,2-Tetrachloroethane	<0.01	0.01
Tetrachloroethene	<0.01	0.01
Toluene	0.05	0.01
1,1,1-Trichloroethane	0.02	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
Xylenes (total)	0.03	0.01

* Results are blank corrected.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126825 >C9381	Date Analyzed:	03/05/93
Sample Identification:	PH-G-3 (1989)	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Butenone	0.6
Acetaldehyde	0.2
Possible Methyl sulfone	0.1
Possible Phosphinic acid, alkyl ester	0.1
Butyl acetate	0.07
Acetonitrile	0.05
Hexanal	0.05
Unknown acid ester	0.04
Fluorotrimethylsilane	0.04
C6H14 hydrocarbon	0.04
Pentanal	0.03
Pentenone	0.03
Propanal	0.02

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126826 >C9233	Date Analyzed:	02/16/93
Sample Identification:	PH-K-4	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.6	0.1
** Benzene	0.74	0.01
** Bromodichloromethane	<0.01	0.01
** Bromoform	<0.01	0.01
** 2-Butanone	0.3	0.1
Carbon disulfide	<0.01	0.01
** Carbon tetrachloride	<0.01	0.01
** Chlorobenzene	0.04	0.01
Chloroform	<0.01	0.01
** Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
** 1,2-Dichloropropane	<0.01	0.01
** cis-1,3-Dichloropropene	<0.01	0.01
** trans-1,3-Dichloropropene	<0.01	0.01
** Ethylbenzene	0.03	0.01
** 2-Hexanone	0.58	0.05
Methylene chloride	<0.05	0.05
** 4-Methyl-2-pentanone	<0.05	0.05
** Styrene	0.08	0.01
** 1,1,2,2-Tetrachloroethane	0.26	0.01
** Tetrachloroethene	<0.01	0.01
** Toluene	0.04	0.01
** 1,1,1-Trichloroethane	<0.01	0.01
** 1,1,2-Trichloroethane	<0.01	0.01
** Trichloroethene	<0.01	0.01
** Vinyl acetate	<0.05	0.05
** Xylenes (total)	0.05	0.01

* Results are blank corrected.

** Concentrations are estimated due to low Internal Standards recovery.

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Analytical Results
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Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126826 >C9233	Date Analyzed:	02/16/93
Sample Identification:	PH-K-4	Temperature:	30
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Phthalic anhydride	100
C12H24 hydrocarbon	7
Acetic acid	4
Formic acid and Possible Methyl sulfone	2
Ethyl hexanol	2
Unknown compound	2
C10H22 hydrocarbon	0.4
C9H16 hydrocarbons	0.4
Unknown aromatic compound	0.3
C10H18 hydrocarbon	0.2
Unknown aldehyde or ketone	0.1
Fluorotrimethylsilane	0.1
Methyl butenone	0.1
C8H16 hydrocarbon	0.09

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126826 >C9228	Date Analyzed:	02/16/93
Sample Identification:	PH-K-4	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.5	0.1
Benzene	0.22	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	0.2	0.1
Carbon disulfide	<0.01	0.01
Carbon tetrachloride	<0.01	0.01
** Chlorobenzene	0.03	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
** Ethylbenzene	0.01	0.01
** 2-Hexanone	0.18	0.05
Methylene chloride	<0.05	0.05
** 4-Methyl-2-pentanone	0.05	0.05
** Styrene	0.04	0.01
** 1,1,2,2-Tetrachloroethane	<0.01	0.01
** Tetrachloroethene	<0.01	0.01
** Toluene	0.03	0.01
1,1,1-Trichloroethane	0.05	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
** Xylenes (total)	0.03	0.01

* Results are blank corrected.

** Concentrations are estimated due to low Internal Standard recovery.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126826 >C9228	Date Analyzed:	02/16/93
Sample Identification:	PH-K-4	Temperature:	50
Analytical Method:	EPA T01 (Modified)		

Additional Compounds

Concentration*
(ug)

Phthalic anhydride	9
C11H22 hydrocarbons	2
Acetic acid	1
C12H24 hydrocarbons	1
C10H20 hydrocarbon and Ethyl hexanal	1
Butenone	0.6
C9H18 hydrocarbon	0.4
Possible Methyl sulfone	0.3
Unknown compound	0.3
Ethyl hexanol	0.3
C10H22 hydrocarbon	0.3
C11H24 hydrocarbon	0.3
Butoxyethanol	0.2

* Results are blank corrected.
Approximate Limit of Detection: 0.01 ug.

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Analytical Results
for
Phifer Wire Products

Clayton Project No. 46431-17

Sample Matrix/Media:	Screens	Date Received:	02/08/93
Lab Number:	126826 >C9384	Date Analyzed:	03/05/93
Sample Identification:	PH-K-4	Temperature:	100
Analytical Method:	EPA T01 (Modified)		

<u>Volatile Compounds</u>	<u>Concentration*</u> <u>(ug)</u>	<u>Limit of</u> <u>Detection</u> <u>(ug)</u>
Acetone	0.2	0.1
Benzene	0.06	0.01
Bromodichloromethane	<0.01	0.01
Bromoform	<0.01	0.01
2-Butanone	<0.1	0.1
Carbon disulfide	0.26	0.01
Carbon tetrachloride	<0.01	0.01
Chlorobenzene	<0.01	0.01
Chloroform	<0.01	0.01
Dibromochloromethane	<0.01	0.01
1,1-Dichloroethane	<0.01	0.01
1,2-Dichloroethane	<0.01	0.01
1,1-Dichloroethene	<0.01	0.01
1,2-Dichloroethene (total)	<0.01	0.01
1,2-Dichloropropane	<0.01	0.01
cis-1,3-Dichloropropene	<0.01	0.01
trans-1,3-Dichloropropene	<0.01	0.01
Ethylbenzene	<0.01	0.01
2-Hexanone	<0.05	0.05
Methylene chloride	<0.05	0.05
4-Methyl-2-pentanone	<0.05	0.05
Styrene	<0.01	0.01
1,1,2,2-Tetrachloroethane	<0.01	0.01
Tetrachloroethene	<0.01	0.01
Toluene	0.02	0.01
1,1,1-Trichloroethane	<0.01	0.01
1,1,2-Trichloroethane	<0.01	0.01
Trichloroethene	<0.01	0.01
Vinyl acetate	<0.05	0.05
Xylenes (total)	0.02	0.01

* Results are blank corrected.

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Emissions From Polymer Coated Fiberglass Screening Material

A Summary of Study Findings

Submitted by:

Clifton D. Crutchfield, Ph.D.
Certified Industrial Hygienist

April 27, 1993

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INTRODUCTION

The following analysis was conducted at the request of Mr. Charles Morgan, Executive Vice President of Phifer Wire Products, Inc., P.O. Box 1700, Tuscaloosa, AL. In response to the request, an analysis has been made of the results of several studies that were conducted to identify and measure emission products from polymer coated fiberglass screening material. Degradation of the polymer coating on installed screens, presumably due to solar exposure, has been reported by a number of users.

Degradation of the screening material has been characterized by changes in appearance and by the presence of unpleasant or irritating odors. Concerns about possible health effects associated with either employee or resident exposures to emissions from degraded screens has prompted a series of four studies by four independent environmental organizations. A listing of the studies by type, date, and organization is included in Table I.

BRIEF SUMMARY OF STUDY RESULTS

Health Effects Group (HEG) Study:

A 1.5 M² sample of degraded sun screen material was observed to have a strong, penetrating odor after being confined in a sealed container. Gas chromatograph/mass spectrometry (GC/MS) analysis of air samples collected from a glass container holding the material produced a number of peaks indicating low levels of volatile organic compounds (VOCs). Direct headspace sampling of the screen material at elevated temperatures, coupled with cryogenic trapping to concentrate emission products, identified the following types of compounds which were present at low levels:

- Four-to-seven carbon ketones
(methyl ethyl ketone and methyl vinyl ketone were most prevalent)
- Pthalates
- Aliphatic hydrocarbons
- Aldehydes
- Trimethylsilanol
- Benzene

It was noted that the ketones were possible sources of the penetrating odors associated with the degraded screen material.

University of Alabama at Birmingham (UAB) Study:

The UAB study consisted of performing headspace sampling followed by GC/MS analysis of 30 cm² samples of weathered and non-weathered screen material. Weathered material produced peak heights that were 10 - 200 times larger than non-weathered samples. Tentative identification of a number of low mass, low boiling point compounds emitted by the screening material was made. Compound identifications were tentative because analytical peak areas (a reflection of amounts emitted) were too small to obtain reliable mass spectral identifications. The compounds appeared to be low levels of oxidation products of the screen coating, various phthalates associated with plasticizers used to manufacture the screen, and color pigments.

A second headspace study was conducted at an elevated temperature of 140 °C to increase emission rates and enhance compound identification. Seven specific compounds thought to be oxidation products of the screen material and associated plasticizers were identified with this technique, including ketones, amines, and weak organic acids. A brief review of the toxicity associated with the identified compounds concluded that they can be strong irritants to the nose, eyes, upper respiratory tract, and mucous membranes. No reference to exposure levels associated with such irritant effects was provided. The report stressed that chronic or long-term health effects were not expected from exposures to the degraded screen material.

Envirocomp (EC) Study:

The EC study involved an indoor air quality assessment of a residence in Hatfield, Massachusetts. Objectional odors from selected screens had been reported by the residence owner. The strongest odors were experienced during periods when direct sunlight contacted the screens. It was also reported that the odors were worse when the screens were newer. For purposes of this study, used screens were removed from storage and re-installed the day before sampling was performed.

A faint odor was reported by the residents when sampling was initiated in the afternoon of a sunny day ($T_{out} = 68\text{ }^{\circ}\text{F}$; $T_{in} = 73\text{ }^{\circ}\text{F}$). Screened windows were in direct sunlight. 100 liter air samples were collected over a 2-hour period on in-line charcoal and Tenax tubes, which were analyzed by GC/MS. Sample locations were in the vicinity of the offensive screens.

Sample results showed a number of low-level unidentifiable peaks of aliphatic hydrocarbons. Specific compounds identified in all samples included xylenes (all isomers), toluene, ethanol, methyl chloroform, and 2-methyl propane. Measured airborne concentrations ranged from 15 - 83 micrograms per cubic meter of air ($\mu\text{g}/\text{M}^3$). The current OSHA exposure limit for toluene is approximately 4,000 times higher than the highest toluene

concentration (83 ug/M³) detected in the home. The other compounds were present in concentrations that were at least 10,000 times lower than their respective OSHA exposure limits. It was acknowledged in the report that workplace exposure limits are not applicable to a residential setting. The OSHA limits were reported as a comparison basis for what is considered to be safe in the work environment.

The EC report concluded in part that:

"Based on the nature of the specifically identified chemicals, it is suggested that they are not from the window screens. These are relatively common chemicals that may be found in a residence from materials such as paints, cleaning compounds, and pressurized containers. They were all found at very low levels, well below what would generally be considered a health hazard. The levels found were also well below the reported odor thresholds, meaning that on the day sampled, the average person would not be able to smell them."

The report also noted that the screens had been stored in the garage for several months, so that the nature or rate of off-gassed vapors could have changed.

Clayton Environmental Consultants (CEC) Report:

The CEC report consisted of two phases. The first phase involved indoor air quality evaluations in three homes whose residents had submitted a variety of complaints, including foul odors, coughing, allergies, burning eyes, and upper respiratory infections.

Direct-reading measurements of temperature, humidity, respirable particulate matter, and carbon dioxide were made in the three homes. Indoor temperature ranges ($T_{out} = 27-29^{\circ}F$; $T_{in} = 73.8-78.5^{\circ}F$) were above the ASHRAE recommended range of 68-74 $^{\circ}F$. Relative humidities (19-26%) were below recommended comfort levels. Respirable particulate matter (10-20 ug/M³) and carbon dioxide levels (400-450 parts per million parts of air) were both below maximum recommended levels.

Air samples were collected in each home for inorganic acids, amines, and VOCs. Analytical results for the inorganic acids and amines in the three homes were all below the analytical limit of detection.

VOC samples were collected on Tenax tubes and analyzed by GC/MS. The following compounds were detected in one or more of the homes: benzene, ethylbenzene, styrene, toluene, 1,1,1-trichloroethane, and xylenes. Each of these compounds is common to modern households. Each compound's measured concentration was less than 10 ug/M³, with two exceptions. In one home,

36 ug/M³ of toluene and 300 ug/M³ of 1,1,1-trichloroethane were detected. A list of tentatively identified compounds were present in concentrations ranging from 0.2 - 10 ug/M³.

The USEPA has reported concentrations of hydrocarbons in non-industrial indoor air as follows:

<u>Contaminant</u>	<u>Concentration Range, ug/M³</u>
Aromatic hydrocarbons	21 - 1,100
Aliphatic hydrocarbons	11 - 270

Another paper by B. Siefert that was cited in the study stated that total VOC concentrations indoors greater than 300 ug/M³ are a point of concern to occupants. Total VOC concentrations in one of the three homes tested exceeded this level.

The CEC report on the indoor air quality assessments concluded that the sampling does not clearly indicate that the screen material is the single or even the major contributor.

The second phase of the CEC study involved headspace analyses of samples of screen material by GC/MS at temperatures of 30, 50, and 100 °C. A variety of volatile organics were detected, typically at fractional microgram levels. The highest reported levels were typically ketones, benzene, and phthalates. 1,1,1-trichloroethane was not observed to be a significant emission product from the screens.

CONCLUSIONS

Emissions from polymer coated fiberglass screening material manufactured by Phifer Wire, Inc. have been characterized in three separate studies. Each study used a gas chromatograph/mass spectrometer to separate and identify compounds that were volatilized from samples of the screen material at elevated temperatures. The samples of screen material were at various stages of degradation that were not characterized by any quantifiable scale.

A variety of compounds, represented as peaks on GC/MS output graphs, were observed in the samples. Most peaks were present in such low concentrations that they could not be reliably identified. Compounds emitted from screen samples at high enough concentrations to be specifically identified have shown a fair degree of consistency. Ketones, benzene, and phthalates seem to be the most prevalent emission products during analyses of the screening material. All compounds were emitted at very low levels.